value than those found in the coast shell-heaps, and skeletons are frequently found in the former and but rarely in the latter. It is probable that at an early time a migration took place from the interior to the coast and Vancouver Island. This migration carried the art of stone-chipping, pipes and decorative art to the coast. The culture of the ancient people who discarded the shells forming these heaps was in all essential particulars similar to that of the tribes at present inhabiting the same area, but it was under a much stronger influence from the interior than is found at the present time.

ARCHÆOLOGICAL excavations have been made by Lieut. L. Desplagnes in the tumuli of Killi, in the region of Goundam, in the neighbourhood of Timbuktu (*cf. l'Anthropologie*, tome xiv. p. 151). The mounds appear to have been the tombs of chiefs, along with whom were buried women and captives, and large quantities of offerings of various kinds. The originators of these funeral monuments surpassed the existing people of the district in the art of making varnished pottery and in the fabrication of bronze. The presence of marine shells shows that they had relation with maritime peoples, and other objects prove an extensive commerce. There appears to be some evidence that these unknown people were partly related to the Berbers, and that they were overwhelmed by the spread of Islamism in the eleventh century. The author thinks that perhaps certain isolated peoples whom he mentions may be the fugitive remnants of this formerly relatively advanced nation.

A MEMOIR on the geology of North Arran, South Bute, and the Cumbraes, with parts of Ayrshire and Kintyre, has just been issued by the Geological Survey. It is the work mainly of the late William Gunn, with contributions by Sir A. Geikie, Dr. Peach, and Mr. A. Harker, and is an explanation of Sheet 21 of the one-inch map of Scotland. A great variety of subjects is dealt with, as may be gathered from the lengthy table of formations represented, and there is much to justify the statement referred to by the authors, that the geology of Arran is an epitome of that of Scotland. The central granite mass forms the dominant feature, rising to 2866 feet at Goatfell, and it is bordered by the older metamorphic rocks, schists into which, as observed by Hutton more than a century ago, the granite has been intruded. Rocks probably of Arenig age, black schists, cherts and grits, similar to those of Ballantrae, and associated with old lavas and tuffs, have been discovered in the course of the survey. Notable additions have also been made to our knowledge of the volcanic rocks, and especially with respect to a huge volcanic vent, probably of Tertiary age, in which are preserved remnants of Rhætic, Liassic and Cretaceous formations, hitherto unrecognised in the region. Full particulars are given of the granite, and of the dykes and sills of felsite and quartz porphyry, pitchstone, and other rocks. The Old Red Sandstone and the Carboniferous rocks, the determination of the Triassic age of the newer red sandstones, conglomerates and marls, and the accounts of the Glacial phenomena and economic geology, furnish many topics of great interest. The memoir contains ten photographic plates, and is issued at the price of 4*s*.

THE additions to the Zoological Society's Gardens during the past week include a Pinche Monkey (*Midas oedipus*) from Colombia, presented by Mr. E. G. Percy; two Grey-headed Love-birds (*Agapornis cana*) from Madagascar, presented by Miss Luff; a Whistling Swan (*Cygnus columbianus*) from North America, presented by Dr. Cecil French; a Mexican Snake (*Coluber melanoleucus*) from Mexico, presented by Mr. W. G. Kershaw; two Whistling Swans (*Cygnus columbianus*), a Mocassin Snake (*Tropidonotus fasciatus*), a King Snake (*Coronella getula*), two Mexican Snakes (*Coluber melanoleucus*), a Seven-banded Snake (*Tropidonotus septemvittatus*), two Testaceous Snakes (*Zamenis flagelliformis*), a Striped Snake (*Tropidonotus ordinatus sirtalis*), a Long-nosed Snake (*Heterodon nasicus*) from North America, a Chained Snake (*Coluber catenifer*), a Couch's Snake (*Tropidonotus ordinatus couchi*) from California, a Horned Lizard (*Phrynosoma cornutum*) from Mexico, two Smooth Snakes (*Coronella austriaca*), an Ocellated Sand Skink (*Chalcides ocellatus*), European; a Black-faced Spider Monkey (*Ateles ater*) from Eastern Peru, a Common Rat Kangaroo (*Potorous tridactylus*), two Brush Bronze-winged Pigeons (*Phaps elegans*) from Australia, a Banded Aracari (*Pteroglossus torquatus*) from Central America, a Rat-tailed Opossum (*Didelphys nudicaudata*), a Salvin's Amazon (*Chrysotis salvini*) from South America, two Cutthroat Finches (*Amadina fasciata*) from West Africa, deposited; a Yak (*Poephagus grunniens*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET 1903 *c*.—The following elements and ephemeris have been computed by M. G. Fayet, Paris, from observations made on June 22, 24, and 27, and published in *Circular* No. 60 of the Kiel Centralstelle :—

Elements.

$T = 1903$ *Aug.* 28·4715 (*M.T. Paris*).

$\omega = 125^\circ\ 56'\ 53''$
$\Omega = 293\ 38\ 40$ } 1903 0.
$i = 84\ 6\ 48$
$\log q = 9{\cdot}539534$

Ephemeris 12*h*. (*M.T. Paris*).

1903	α (h. m. s.)	δ	log Δ	Brightness
July 5	21 27 33	+12° 10′·9	9·6105	4·5
,, 9	21 6 46	+24 44·8	9·5213	7·6
,, 13	20 26 15	+38 57·9	9·4322	12·9
,, 17	18 53 22	+60 43·0	9·4424	14·1
,, 21	15 46 14	+68 40·8	9·4948	12·9

On July 13 the comet will, according to the above ephemeris, be about 7m. 20s. following, and 58′·9 south of γ Cygni, whilst on July 21 it will be seen in the constellation Draco a little more than one-third the distance from γ Ursæ Minoris to η Draconis on a straight line joining these two stars.

The above scale of brightness takes for its unit value the brightness at the time of discovery, and on June 25, when the value on this scale was about 1·4, M. Pidoux recorded that the comet was equal in brightness to an eighth magnitude star.

PENETRATIVE SOLAR RADIATIONS.—In a paper communicated to No. 24 of the *Comptes rendus*, M. R. Blondlot describes some simple experiments he has performed which appear to show that certain rays (which he calls "the *n* rays") emitted by the sun are capable of passing through various kinds of wood, metals, &c. He placed a fine glass tube containing a phosphorescent material, *e.g.* sulphide of calcium, in a darkened room in which there was a window exposed to the sun, but closed by means of an oaken shutter 15mm. thick, and then found that the phosphorescent material, which he had previously exposed for a very short time to feeble sunlight, continued to glow, but if a plate of lead were interposed between the shutter and the tube the phosphorescence became feebler, whilst it again increased when the lead was removed. Then an oaken joist 3cm. thick, a piece of cardboard, and several plates of aluminium were successively interposed, and the

phosphorescence emitted did *not* diminish, but a thin layer of pure water entirely arrested the *n* radiations. These radiations may be concentrated by a quartz lens, but are regularly reflected by a polished glass surface, whilst an unpolished glass surface diffuses them.

THE SPECTRA OF METALS AND GASES AT HIGH TEMPERATURES.—In No. 25, vol. xxxviii., of the *Proceedings* of the American Academy of Arts and Sciences, Prof. J. Trowbridge gives the details and results of an exhaustive series of experiments on the spectral phenomena observed when gases and metals are together subjected to high temperatures. Employing a large variety of conditions as to the temperature employed, the size of the capillary tubes and the materials from which they are made, and the distance and material of the poles, Prof. Trowbridge arrives at several interesting conclusions, all of which tend to show that in many cases the lines obtained are possibly due to products of the interactions between the gas, the poles, and the containing tube, which take place at high temperatures, rather than to the elements themselves. For instance, the metallic lines obtained from terminals placed 1cm. apart in rarefied air, or hydrogen, were reversed, the reversal coinciding in position with the line obtained in ordinary air, but the line was much broadened on the least refrangible side. The author suggests that this indicates the presence of a gaseous product, probably due to the oxidation or hydration of the poles. Again, when highly heated and rarefied hydrogen, or air, was passed through a tube of amorphous silicon or glass, broad bands, coinciding with the fainter silicon lines obtained under ordinary conditions, were produced, and Prof. Trowbridge believes that in the case of highly refractive metals, such as silicon, these bands are not really due to the metals themselves, but to the interaction between the metals and gases present.

The experiments showed that iron lines did not appear under what seemed to be favourable conditions, whilst aluminium lines did appear under these conditions. For this reason the author enters a *caveat* as to the care it is necessary to exercise when classifying stars solely from the variations in the appearances of their respective spectra.

ZENITH-TELESCOPE RESULTS.—In vol. ii. part i. of the *Publications* of the University of Pennsylvania (Series in Astronomy), Mr. C. L. Doolittle, director of the Flower Observatory, gives the results obtained from the observations made with the zenith-telescope during the period September 6, 1898, to August 30, 1901. After describing the corrections applied to the observed values, the report gives full details of each observation and its corrections, and then gives the values of the "aberration constant" determined during 1898–1899 and 1900–June, 1901, as $20''.540 \pm 0''.0103$ and $20''.561 \pm 0''.0085$ respectively. A curve and a set of tables, showing the variation of latitude at Philadelphia from October 1, 1896, to August 30, 1901, are also included in the report.

PHOTOMICROGRAPHY WITH A BROWNIE CAMERA.

THIS article does not put forth anything new in principle, but is the explanation of a simple method by which any student can, with little trouble and little expense, produce his own photographs of microscope objects, the idea being to direct attention to the inexpensiveness of the necessary apparatus.

The apparatus required includes only a small microscope and a light "fixed-focus" camera, and, of course, the necessaries for developing the negatives. The writer used a microscope of the rigid type generally regarded as little more than a toy, and worth only a very few shillings, and a Brownie Kodak. The instruments need practically no alterations to make them fit for use; the utmost that need be done is this:—Cut a piece of rather thick cardboard the same size as the front of the camera, and in the centre of it make a round hole to fit the eye-piece of the microscope. Glue this to the camera front.

In use the microscope is focused on object for distinct vision for a normal eye. If the experimenter be long- or short-sighted, then he must use appropriate spectacles.

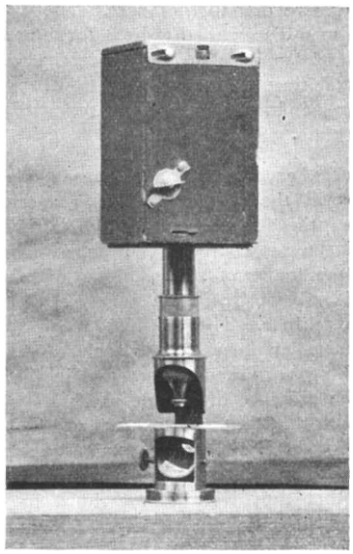
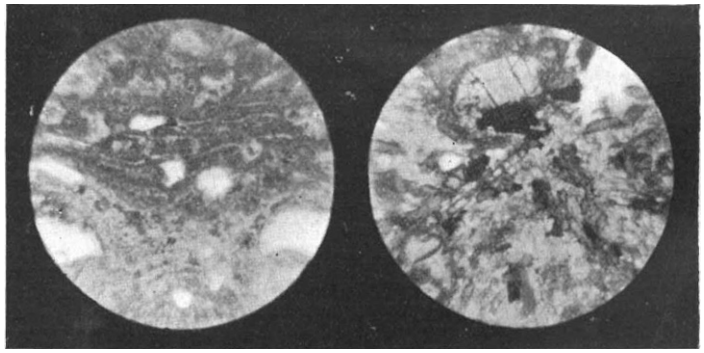


FIG. 1.

The light issuing from the eye-piece is thus rendered parallel, and if the camera be placed on the top of the eye-piece an image of the object will be in focus on the sensitive film. Of course, the optical axes of the camera and microscope must be parts of the same straight line, and the card glued to the camera is to assist the centring. The visual field is the exact area photographed.



Rhyolite. Olivine Diorite.

FIG. 2.

The exposure is made in the usual way, using the camera shutter. In the middle of a fine day exposures of from one to two minutes have been found ample, while in the evening ten or twenty minutes are necessary, using plates of the speed generally known as "Special Rapid." The Brownie camera is made for roll-films, but plates may be used thus:—The camera back is opened and a plate $2\frac{1}{2}'' \times 2\frac{1}{2}''$ laid on the frame over which the film is generally passed. On the back of the plate is placed a piece of black paper or thin card, and the back closed. This paper is necessary in order to exclude the light from the little red window, which is not non-actinic.

After exposure development is proceeded with in the ordinary way, using pyro-soda or any other developer the experimenter may prefer.

It will be seen from the specimens that the definition is, of course, not of the highest order, but considering the apparatus, one must not expect too much. The photo-